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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No.	KLR:7146.017
First Inventor or Application Identifier	Thomas M. Gillihan
Title	PRINTER CONTROLLER WITH ERROR RECOVERY FOR MULTIPLE LANGUAGE CAPABILITY
Express Mail Label No.	EM571163535US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

1. [X] * Fee Transmittal Form *(e.g., PTO/SB/17)* (Submit an original and a duplicate for fee processing)
2. [X] Specification [Total Pages 16] (preferred arrangement set forth below)
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. [X] Drawing(s) *(35 U.S.C. 113)* [Total Sheets 6]
4. Oath or Declaration [Total Pages 22]
   a. [X] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 C.F.R. § 1.63(d)) *(for continuation/divisional with Box 17 completed)* *[Note Box 5 below]*
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).
5. [ ] Incorporation By Reference *(useable if Box 4b is checked)* The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered to be part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. [ ] Microfiche Computer Program *(Appendix)*
7. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   a. [ ] Computer Readable Copy
   b. [ ] Paper Copy (identical to computer copy)
   c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. [X] Assignment Papers (cover sheet & document(s))
9. [X] 37 C.F.R.§3.73(b) Statement *(when there is an assignee)* [X] Power of Attorney
10. [ ] English Translation Document *(if applicable)*
11. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
12. [ ] Preliminary Amendment
13. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
14. [ ] * Small Entity Statement(s) *(PTO/SB/09-12)* [ ] Statement filed in prior application, Status still proper and desired
15. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. [X] Other: ..check for $830.00.....

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17. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment:*
    [ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: _____/_____
    Prior application information: Examiner _____ Group / Art Unit: _____

18. CORRESPONDENCE ADDRESS

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Name (Print/Type)	Bruce W. DeKock	Registration No. (Attorney/Agent)	40,585
Signature	Bruce W. DeKock	Date	8/4/98

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FEE TRANSMITTAL

Patent fees are subject to annual revision on October 1.
These are the fees effective October 1, 1997.
Small Entity payments must be supported by a small entity statement, otherwise large entity fees must be paid. See Forms PTO/SB/09-12.
See 37 C.F.R. §§ 1.27 and 1.28.

TOTAL AMOUNT OF PAYMENT ($) 830.00

Complete If Known	
Application Number	
Filing Date	
First Named Inventor	Thomas M. Gillihan
Examiner Name	
Group / Art Unit	
Attorney Docket No.	KLR:7146.017

METHOD OF PAYMENT (check one)

1. [X] The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

Deposit Account Number: 03-1550
Deposit Account Name: Chernoff, Vilhauer

[X] Charge Any Additional Fee Required Under 37 C.F.R. §§ 1.16 and 1.17
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2. [ ] Payment Enclosed:
[X] Check [ ] Money Order [ ] Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	790	201	395	Utility filing fee	$790.00
106	330	206	165	Design filing fee	
107	540	207	270	Plant filing fee	
108	790	208	395	Reissue filing fee	
114	150	214	75	Provisional filing fee	
				SUBTOTAL (1)	($) 790.00

2. EXTRA CLAIM FEES

	Extra Claims		Fee from below	Fee Paid
Total Claims	18 -20** =	-0-	X	=
Independent Claims	2 -3** =	-0-	X	=
Multiple Dependent				=

**or number previously paid, if greater; For Reissues, see below

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	22	203	11	Claims in excess of 20
102	82	202	41	Independent claims in excess of 3
104	270	204	135	Multiple dependent claim, if not paid
109	82	209	41	** Reissue independent claims over original patent
110	22	210	11	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) -0-

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	400	216	200	Extension for reply within second month	
117	950	217	475	Extension for reply within third month	
118	1,510	218	755	Extension for reply within fourth month	
128	2,060	228	1,030	Extension for reply within fifth month	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,320	241	660	Petition to revive - unintentional	
142	1,320	242	660	Utility issue fee (or reissue)	
143	450	243	225	Design issue fee	
144	670	244	335	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	40.00
146	790	246	395	Filing a submission after final rejection (37 CFR 1.129(a))	
149	790	249	395	For each additional invention to be examined (37 CFR 1.129(b))	
				Other fee (specify)	
				Other fee (specify)	

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 40.00

SUBMITTED BY				Complete (if applicable)	
Typed or Printed Name	Bruce W. DeKock			Reg. Number	40,585
Signature	Bruce W. DeKock	Date	8/4/98	Deposit Account User ID	03-1550

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PRINTER CONTROLLER WITH ERROR RECOVERY FOR MULTIPLE LANGUAGE CAPABILITY

BACKGROUND OF THE INVENTION

The present invention relates to a print engine that includes error recovery, and in particular to a print engine with multiple language capability that includes error recovery.

Personal computers have become commonplace on the desks of most office workers. Typically, much of the work product of such computers is intended to be transformed into hard copy using a printer having digital imaging technology. A typical printer configuration for this purpose is a printer dedicated to each personal computer. However, dedicated printers are typically inexpensive laser printers which have limited functions and features, such as a limited tray capacity and no finishing capability. More importantly, inexpensive laser printers typically handle only one page description language.

Expensive high speed laser printers normally have flexible finishing and copy sheet capability which allows for example, custom printing and finishing of work product. Such a laser printer would be highly desirable for each personal computer, but is cost prohibitive. In practice, personal computers are frequently networked together which permits a single printer to be used simultaneously by a plurality of different clients, such as personal computers or the like.

Referring to FIG. 1, data processing terminals 10a, 10b and 10c, such as personal computers, transmit electronic print documents through a local area network (LAN) 12 to a selected printer 14a or 14b for printing. In particular, the LAN 12 provides a medium by which different terminals are able to share resources such as printers 14a, 14b, file servers, a printer server(s) 16, and scanners. Integration of shared resources has been

addressed by LAN managers using different network protocols, such as Ethernet and Token Ring, to make different devices running different network protocols transparent to the terminals. Most printer servers 16 and many printers 14a, 14b support a variety of print drivers using different page description languages (PDLs).

A PDL is a method of describing a printed page(s) in a printer independent format. No single standard PDL presently exists, and as a result a number of industry standards have emerged. A PDL establishes an interface between a print driver or client (terminal or personal computer), and a printer server or printer. Several currently existing PDLs include PostScript (PS), Hewlett Packard Printer Control Language (HP-PCL), and Interpress Page Description Language.

In existing systems, the processing of the PDL data takes place using an interpreter, which reads the received PDL data (typically text) and creates corresponding bit mapped data which is provided to the printer engine. The printer engine transforms received digital data into areas of black or colored ink on the paper or other medium fed into the printer.

In networked systems, in which several users at various terminals are sharing a single printer, a desirable feature is that each terminal (i.e., each user) will "see" the network accessible printer as "dedicated" to that user. In other words, when a user transmits a document to be printed on the central printer, the user desires the same service as if the printer was dedicated to that terminal. In fact, most printer interfaces used on personal computers are designed to operate in a fashion that appears to the user as a one-to-one relationship between the terminal and the printer. A user does not want to observe any delays caused by an undesirable interaction of his print job with another job from a different user to be printed on the central networked printer at generally the same time. Further, an

important customer requirement is that the networked printer is capable of receiving document data in a variety of different PDLs. As mentioned above, two common types of PDLs are PostScript and HP-PCL.

Many printers (or print servers) incorporate a plurality of language interpreters to facilitate printing documents that are transmitted to the printer in a variety of PDL formats. In such a printing system, one of several PDL interpreters within the printer (or print server) is automatically selected depending upon the PDL format of the print data from a particular data processing device. Accordingly, the appropriate language interpreter must be selected for each print job. There are numerous patents describing printer controllers which include multiple interpreters, such as, U.S. Patent No. 4,651,278; U.S. Patent No. 4,965,771; U.S. Patent No. 4,968,159; U.S. Patent No. 5,036,476; U.S. Patent No. 5,165,014; U.S. Patent No. 5,226,112; U.S. Patent No. 5,228,118; U.S. Patent No. 5,303,336; U.S. Patent No. 5,402,527; U.S. Patent No. 5,475,801; and U.S. Patent No. 5,592,683, all of which are incorporated herein by reference.

In an ideal situation the transmission and processing of printer data is error-free. As such, all of the print jobs will likely print properly. Unfortunately, errors periodically occur in the data transmitted from the terminal to the printer, data is lost or corrupted within the printer itself, protocol failures mix different data streams at the printer server or in the printer, and errors originate within the client or printer software. For example, if PostScript data is being transmitted to the printer and an error occurs, then the printer may interpret the data as standard text which likely results in printing an extensive number of pages containing "garbled" data.

Printer description languages typically include synchronization and setup data at the beginning, and at

intermediate locations, within each document. When errors occur within a document, either a portion of the page will be corrupted while the remainder of the document prints properly, or the printer will become sufficiently confused and continue printing at the next synchronization point. Unfortunately, the next synchronization point for many documents is not until the next document, which results in the loss of the remainder of the current document. This technique of error recovery is typically used in printers that support only one PDL.

For printers that support multiple language interpreters it has been observed that frequently when an error occurs in a first document, the remainder of the document is lost in a manner similar to printers with a single language interpreter. Unfortunately, the next document is frequently likewise lost resulting in additional frustration to users.

Alternatively, the printer may request the retransmission of all or part of the PDL stream in which an error is found. However, retransmission requires a two-way communication between the printer and the originating producer of the PDL data which is typically not available in heterogeneous distributed networking environments.

What is desired, therefore, is an error recovery system for a print engine that does not result in the loss of the next document following an error.

SUMMARY OF THE PRESENT INVENTION

The present invention overcomes the aforementioned drawbacks of the prior art by providing a system for error recovery when printing documents having multiple printer description language formats. In particular, a document to be printed on a printer is received. The document is then examined to select one of a plurality of parsers suitable to parse the printer description language of the document. In response to

examining the document to determine its format, the document is processed by selecting at least one of a first printer description language and a second printer description language for parsing the document. The remainder of the document is examined for synchronization data while the document is parsed.

By examining the document for synchronization data while parsing the document for printing the improved printing system does not result in the loss of subsequent documents when the synchronization data is inadvertently processed as data of a different printer description language. Preferably the system uses pointers and a buffer to permit the resetting of the page description language parsing process to the appropriate data stored within the buffer upon the detection of an error, such as when the end of document control codes in the document includes an error or is missing. For multi-stage printers that include multiple documents in the printing que which require printing, collating, and stapling, the avoidance of any preventable errors is extremely important. In the event of an unrecoverable error, it is time consuming and expensive to restart the job and clear the printer, collator, and stapler of the improperly processed job.

The foregoing and other objectives, features, and advantages of the invention will be more readily understood upon consideration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is block diagram of a printing system including data processing terminals, local area network, printer server, and printers.

FIG. 2 is an illustration of document flow within a printer.

FIG. 3 is a block diagram of the temporal processes within current printer systems.

FIG. 4 is an illustration of document flow within a printer including an error therein.

FIG. 5 is a block diagram of an exemplary embodiment of the temporal processes within a printer system of the present invention.

FIG. 6 is another illustration of document flow within a printer including an error therein.

FIG. 7 is an illustration of the process sequence of document flow within a printer including a page description language determination, a page description language parser, pointers, and data buffer contents.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 2, printers may incorporate multiple language interpreters i, j, and k, multiple print jobs n, n+1, and n+2, each of which may have a different PDL i, j, and k, that are concatenated on a communication channel by virtue of the printer server or directly under the control of intercommunication between the printer and the individual data processing terminals 10a-10c. Print jobs are generated asynchronously, and thus may arrive at the printer in any temporal relationship. Current printers generally incorporate a mechanism for arbitrating among network clients, and a given printer will communicate with one and only one data processing terminal or server until the entirety of a print job has been received and placed into an internal queue (or processed in its entirety) before engaging in negotiation with another terminal or server to receive a subsequent print job. Many printers contain sufficient memory and/or storage to hold multiple pending print jobs while a current job is being interpreted and printed. Therefore, it is clear that the communication channel between the printer and the originator of a print job

data stream may have been terminated before the contents of the data stream are parsed and processed.

Referring to FIG. 3, typical processing elements within a printer include a series of processes and steps that are executed in a particular predefined manner. When there are no prior documents in the print queue of the printer, a new document data stream is received by the master control process 40 which manages the hardware of the printer and the different document flows through the printer. As such, the master control process 40 receives and responds to internal and external data sensor input, as well as managing the initiation and termination of other subprocesses within the printer. After receipt of a document, the master control process 40 initiates a data receiver process 42 which manages communication within the local area network, reads the data stream from a print job, and stores data in an internal data buffer. Next, a printer description language (PDL) determination process 44 examines the current contents of the data buffer, and determines the particular PDL of the initial portion of the data buffer contents. This process permits the identification of the particular PDL language encoding of the document. The data receiver process 42 may terminate prior to the completion of the PDL determination process 44 or may continue concurrently with the process, depending on the characteristics of the printer and the state of network print job requests. Once the determination is made as to which PDL language the document is encoded in, the PDL determination process 44 is terminated because the remainder of the document is always encoded using the same technique. Then control is passed to the PDL parsing process 46, which reads data from the buffer and creates the corresponding output bitmap which is then transformed into the printed page(s).

With such a printing process, it has been accepted that if an error occurs that the PDL parsing

process 46 is unable to recover from, then the PDL parsing process 46 will terminate and notify the master control process 40 of the error. The master control process 40 then starts both the data receiver process 42, if deactivated, and starts the PDL determination process 44 to search for the next synchronization point. The next synchronization point in many cases is the following document. Also, several pages of "garbage" will likely print upon the occurrence of an error. Moreover, the next document is frequently lost resulting in additional user frustration.

Referring to FIG. 4, the present inventors came to the realization that the principal reason that the printing process periodically discards the second document 62 after an error occurs in the first document 60 is that the end of document control codes 64 in the first document include an error or are missing. Without the end of document control codes 64, the PDL parsing process 46 attempts to parse the synchronization data 66 of the second document 62 as if it were data of the previous document. In such an event, several lines of synchronization data 66 of the second document 62 are processed before the PDL parsing process 46 determines that an error has occurred. The PDL parsing process 46 then notifies the master control process 40 of the error which then reinitializes the data receiver process 42 and the PDL determination process 44. The PDL determination process then looks for the next synchronization point. Normally, this results in waiting until a third document 70 because the synchronization data 66 of the second document 62 has already been inappropriately processed as data by the PDL parsing process 46. Periodically, while searching for synchronization data, the PDL determination process 44 locates data within the second document 62 that matches another printer description language. The PDL parsing process 46 will then attempt to process the remaining second document 62 with the matched printer

description language, which may not be the proper printer description language for the second document 62, resulting in many pages of "garbage."

With the aforementioned realization of the reason why the printing process periodically discards the second document 62 after an error occurs in the first document 60, the present inventors developed an improved printing system to overcome this limitation. Referring to FIG. 5, the master control process 80 initiates the data receiver process 82, and when sufficient data is present in the data stream buffer 83, the PDL determination process 84 is initiated to determine the PDL of the data stream. However, once the PDL is identified and the appropriate PDL paring process 86, 88, 90, or 92 is initiated, the PDL determination process 84 continues to execute, reading characters from the data stream buffer 83 and determining potential points at which the PDL may have changed. As segments of the data stream are processed (for example, at the end of each page), the selected PDL parsing process 86, 88, 90 or 92 sends a signal to the PDL determination process 84 to advance its pointer in a data buffer to the most recent data byte which has been parsed with no ambiguity.

Referring to FIG. 6, if three data streams n 100, n+1 102 and 104 n+2 are received in sequence by the data receiver process 82, prior to the completion of processing of the first data stream 100, the data streams are stored in the data buffer. To illustrate the improved technique, assume that an error exists in data stream n+1 102. As data stream n 100 is processed, the PDL determination process 84 recognizes that data stream n 100 as consisting of PDL i commands 106 and accordingly the PDL i parsing process 86 is activated. When job n 100 is finished without error, the PDL determination process 84 is reinitialized and will proceed to analyze data stream n+1 102 and recognizing it as consisting of PDL j commands 108. The PDL j parsing process 88 will be

activated. As segments of job n+1 102 are completed, the data buffer corresponding to the PDL determination process 84 is advanced in stages, and the PDL determination process 84 continues to evaluate the buffer contents to determine the PDL language of the contents starting at each intermediate point. When erroneous data is detected 112 in data stream n+2 104 (such as missing or corrupted end of document control codes 110), the PDL parsing process 88 exits with an error condition and the PDL determination process 84 immediately determines the most probable language corresponding to the buffer contents at the last prior intermediate point signaled by the PDL parsing process 88. In this example, the PDL determination process 84 requires the presence of an appropriate preamble or header for a valid data stream prior to signaling recognition of the PDL, after which the corresponding PDL parsing process 86, 88, 90, and 92 is activated. A buffer pointer corresponding to the position in the buffer where the PDL determination process 84 found an appropriate preamble or header may be prior to the position at which the previous PDL parsing process 88 found the error. In this example, the buffer pointer is reset to the start of data stream 104 and the PDL determination process 84 actuates PDL parsing process 90 for PDL k. The result is proper printing of data stream n+2 104.

Referring to FIG. 7, the temporal sequence of operations illustrates that the PDL parsing operation stays active, while keeping track of a position in the data buffer at which the identify of the PDL of the corresponding data was relatively certain. When an error is encountered, the PDL determination process can reestablish the identify of the PDL stream in the buffer starting from the prior acknowledgment point, and prevent the loss of a complete job from the data stream. Conventional processing for the documents of FIG. 7 would have resulted in the loss of document n+2. Under the improved

processing document n+2 is not lost because the error is detected and the parser is reset to the beginning of document n+2 from the buffer.

Accordingly, the improved printing process does not result in the loss of subsequent documents when the synchronization data is inadvertently processed as data of a different printer description language. The use of pointers and the buffer permits the resetting of the PDL parsing process to the appropriate data stored within the buffer upon the detection of an error, such as when the end of document control codes in the document includes an error or is missing. For multi-stage printers that include multiple documents in the printing que which require printing, collating, and stapling, the avoidance of any preventable errors is extremely important. In the event of an unrecoverable error, it is time consuming and expensive to restart the job and clear the printer, collator, and stapler of the improperly processed job.

The terms and expressions which have been employed in the foregoing specification are used therein as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding equivalents of the features shown and described or portions thereof, it being recognized that the scope of the invention is defined and limited only by the claims which follow.

CLAIMS:

1. A print engine for a printer comprising:

(a) a first process that receives a document to be printed on a printer;

(b) a second process that examines said document to select which of a plurality of third processes is suitable to parse the printer description language of said document;

(c) a first one of said plurality of third processes processing said document using a first printer description language in response to said selection of said second process;

(d) a second one of said plurality of third processes processing said document using a second printer description language in response to said selection of said second process; and

(e) said second process not terminating prior to said selected third process parsing said document.

2. The print engine of claim 1 wherein said second process continues to examine said document for synchronization data while said third process parses said document.

3. The print engine of claim 1 wherein said second process is a printer description language determination process and said first process is a data receiver process.

4. The print engine of claim 1 wherein said third processes are printer description language parsing processes for different printer description languages.

5. The print engine of claim 1, further comprising a master control process that receives and responds to internal and external data sensor input.

6. The printer engine of claim 1 wherein said first printer description language is selected from the group of HP-PCL, PostScript, and Interpress Page Description Language.

7. The printer engine of claim 1, further comprising:

(a) said first process receives a plurality of documents; and

(b) said second process examines each of said plurality of documents to select which of said plurality of third processes are suitable to parse the printer description language of each of said respective documents.

8. The printer engine of claim 7, further comprising:

(a) said second process examines said plurality of documents for synchronization data; and

(b) said second process examining said document for said synchronization data simultaneously with said selected third process parsing said document.

9. The printer engine of claim 8, further comprising:

(a) said selected third process detecting an error within one of said documents; and

(b) said second process initializing a different one of said selected third processes in response to said selected

third process detecting an error within said document.

10. A method of printing documents comprising the steps of:

(a) receiving a document to be printed on a printer;

(b) examining said document to select one of a plurality of parsers suitable to parse the printer description language of said document;

(c) in response to step (b) processing said document by selecting at least one of a first printer description language and a second printer description language; and

(d) said examining of step (b) continuing to examine said document for synchronization data while said processing of step (c).

11. The print engine of claim 10 wherein said receiving of step (a) is a data receiver process.

12. The print engine of claim 10 wherein said examining said document of step (b) is a printer description language determination process.

13. The print engine of claim 10 wherein said processing of step (c) are printer description language parsing processes for different printer description languages.

14. The print engine of claim 10, further comprising the step of providing a master control process that receives and responds to internal and external data sensor input.

15. The printer engine of claim 10 wherein said first printer description language is selected from the group of HP-PCL, PostScript, and Interpress Page Description Language.

16. The printer engine of claim 10, further comprising the steps of:

(a) receiving a plurality of documents; and

(b) examining each of said plurality of documents to select which printer description language is suitable to parse the printer description language of each of said respective documents.

17. The printer engine of claim 16, further comprising the steps of:

(a) examining said plurality of documents for synchronization data; and

(b) examining said documents for said synchronization data while said processing said document by said selecting said at least one of said first printer description language and said second printer description language.

18. The printer engine of claim 17, further comprising the steps of:

(a) detecting an error within one of said documents; and

(b) initializing a different one of said selected said at least one of a first printer description language and said second printer description language.

PRINTER CONTROLLER WITH ERROR RECOVERY FOR MULTIPLE LANGUAGE CAPABILITY

ABSTRACT OF THE DISCLOSURE

A system for error recovery when printing documents has multiple printer description language formats. In particular, a document to be printed on a printer is received. The document is then examined to select one of a plurality of parsers suitable to parse the printer description language of the document. In response to examining the document to determine its format, the document is processed by selecting at least one of a first printer description language and a second printer description language for parsing the document. The remainder of the document is examined for synchronization data while the document is parsed.

EXPRESS MAIL

EP 0 838 760 A2

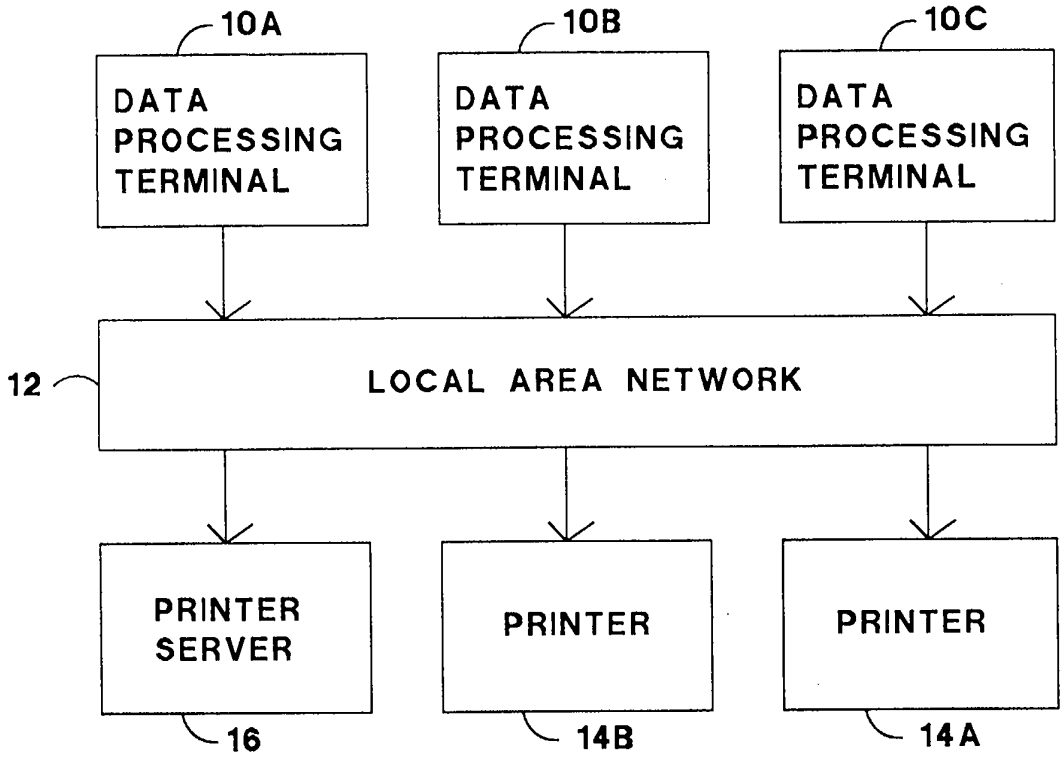

FIG. 1

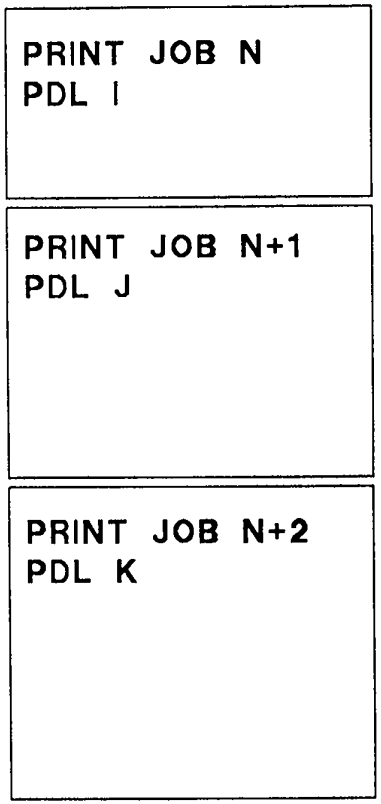

FIG. 2

96n093" 0856260

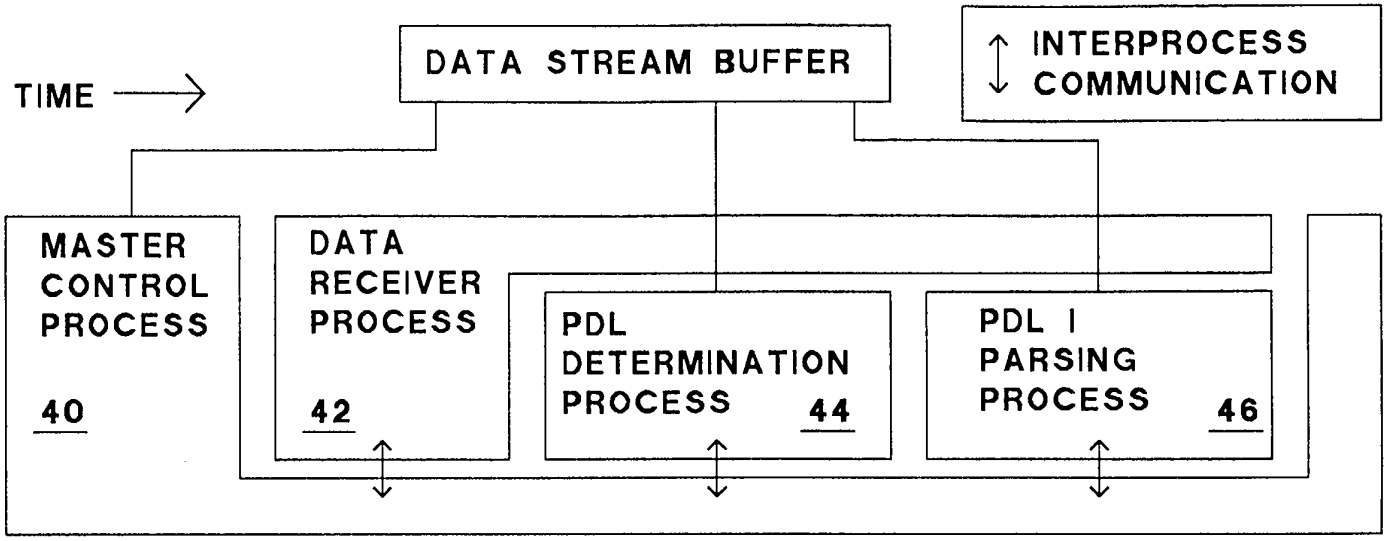

FIG. 3

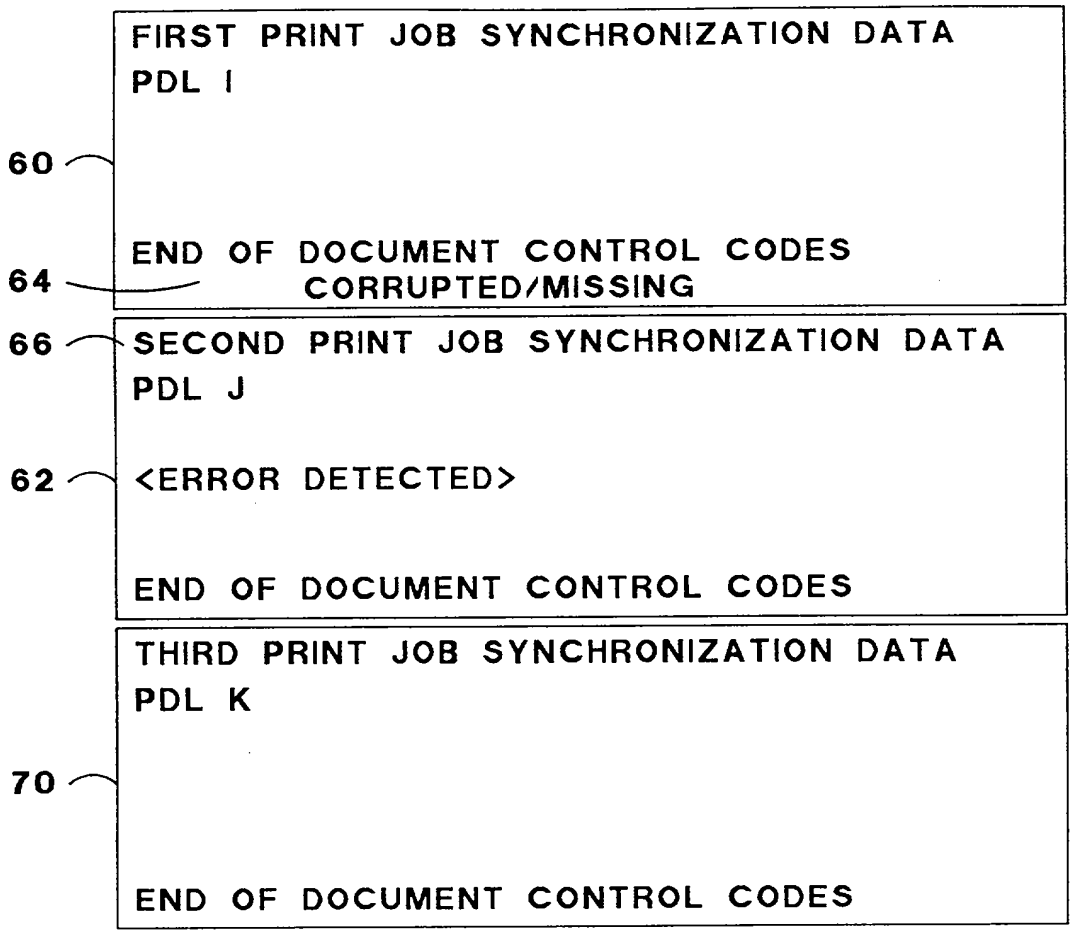

FIG. 4

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86090 D8582760

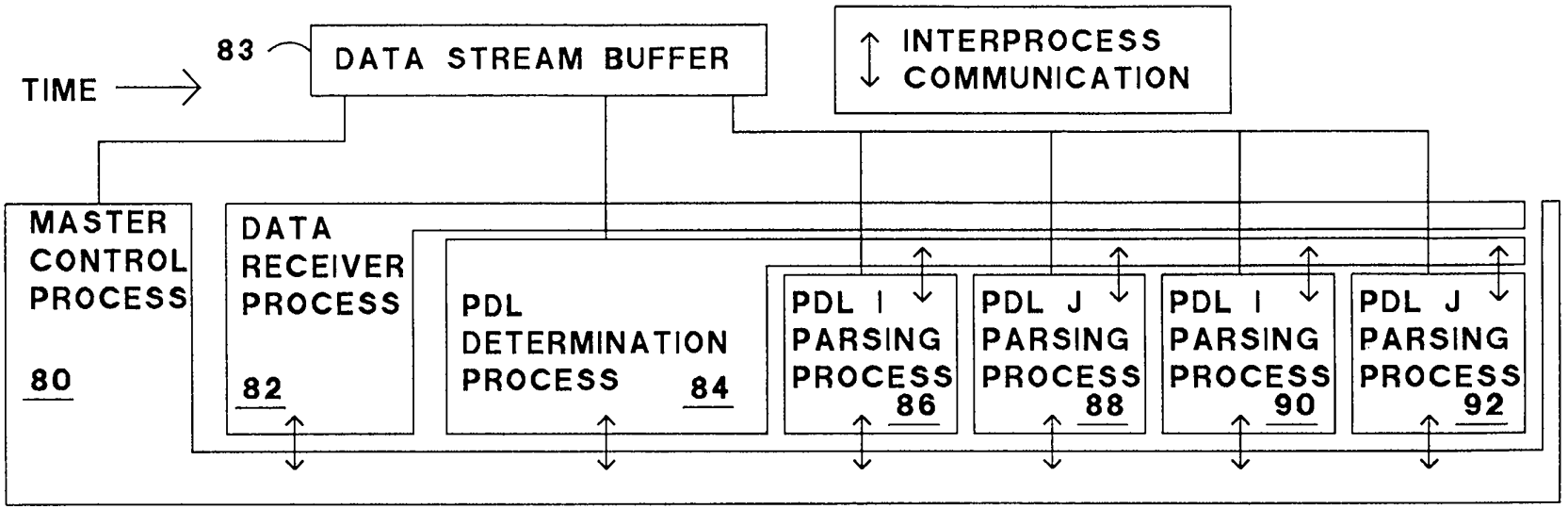

FIG. 5

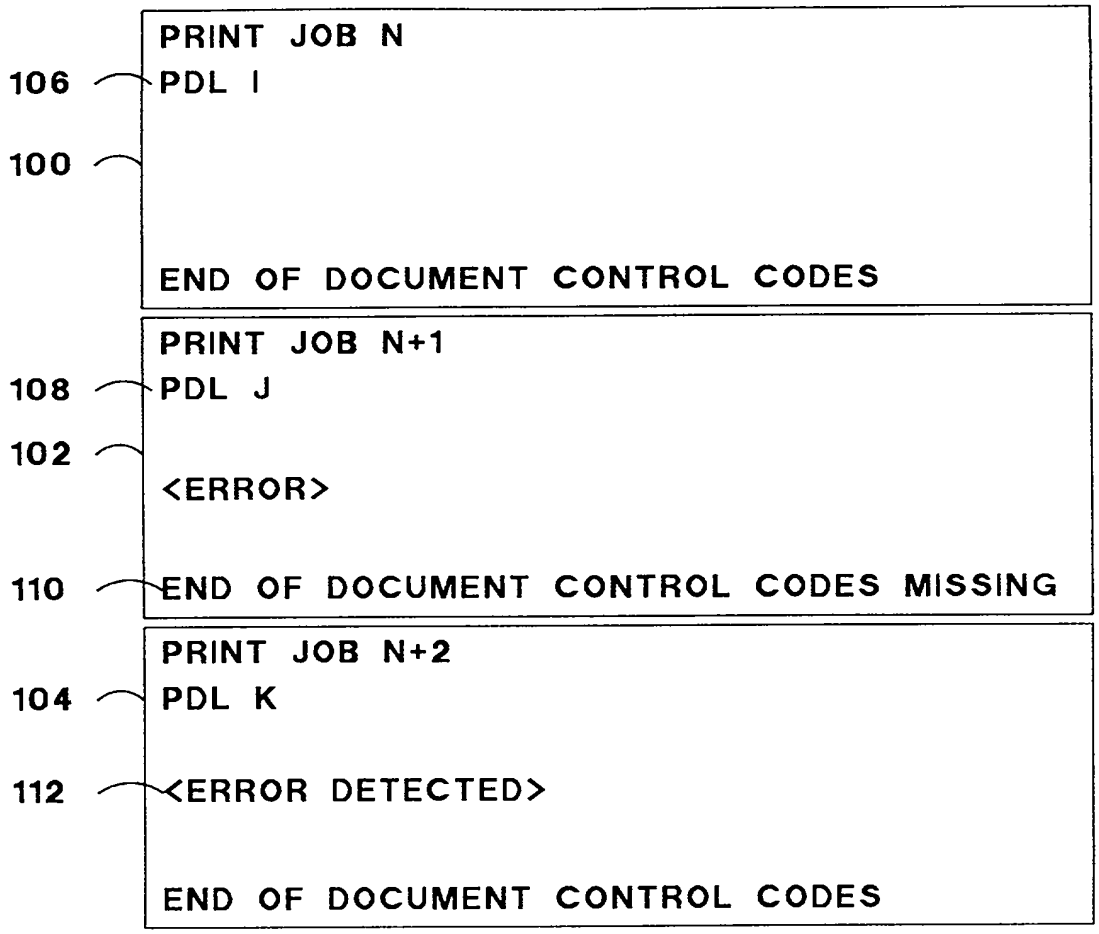
PRINT JOB N
106
PDL I
100
END OF DOCUMENT CONTROL CODES
PRINT JOB N+1
108
PDL J
102
<ERROR>
110
END OF DOCUMENT CONTROL CODES MISSING
PRINT JOB N+2
104
PDL K
112
<ERROR DETECTED>
END OF DOCUMENT CONTROL CODES

FIG. 6

86n080" 0858276D

PDL DETERMINATION	POINTER	PDL PARSER	POINTER	DATA BUFFER CONTENTS	
INITIALIZED JOB N	100			100	JOB N
PDL I FOUND	100				PDL I
		PDL I INITIALIZED (PROCESSING)	100		
		END OF PAGE	101		
ACKNOWLEDGE BUFFER POINTER RESET	101			101	END OF PAGE 1
		END OF JOB N	102		END OF JOB
ACKNOWLEDGE BUFFER POINTER RESET	102				
---END OF JOB N---				102	
INITIALIZE JOB N+1	102				JOB N+1
PDL J FOUND	102				PDL J
		PDL J INITIALIZED (PROCESSING)	102		
		END OF PAGE 1	103	103	END OF PAGE 1
ACKNOWLEDGE BUFFER POINTER RESET	103				
		(PROCESSING)			
		END OF PAGE 2	104	104	END OF PAGE 2
ACKNOWLEDGE BUFFER POINTER RESET	104				
		(PROCESSING)			
		ERROR DETECT	106		<ERROR>
ACKNOWLEDGE REINITIALIZE	104				
PDL K FOUND	105				
		PDL K INITIALIZED (PROCESSING)	105	105	JOB N+2 PDL K
		END OF PAGE 1	107	106	<ERROR DETECTED>
ACKNOWLEDGE BUFFER POINTER RESET	106			107	END OF PAGE 1 END OF JOB

FIG. 7

DECLARATION

As a below named inventor, we hereby declare that:

Our residence, post office address and citizenship are as stated below next to my name,

We believe we are the original, first and joint inventors of the subject matter which is claimed and for which a patent is sought on the invention entitled:

PRINTER CONTROLLER WITH ERROR RECOVERY
FOR MULTIPLE LANGUAGE CAPABILITY

the specification of which

[X] is attached hereto.

[ ] was filed concurrently herewith as Application Serial No. _____ and was amended on _____ (if applicable).

We hereby state that we have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above.

We acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

We hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

(Number)	(Country)	(Day/Month/Year Filed)	Priority Claimed
_____	_____	_____	[ ] Yes [ ] No
_____	_____	_____	[ ] Yes [ ] No
_____	_____	_____	[ ] Yes [ ] No

We hereby claim the benefit under Title 35, United States Code, §120, of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, we acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Ser. No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Ser. No.)	(Filing Date)	(Status) (patented, pending, abandoned)

We hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: 23 JULY 1998

Full name of sole inventor	Thomas M. Gillihan
Residence	Portland, Oregon
Citizenship	United States of America
Post Office Address	22870 SW Eno Place Tualatin, OR 97062

Dated: 23 JULY 1998

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Residence	Portland, Oregon
Citizenship	United States of America
Post Office Address	3707 NW Thurman Street Portland, OR 97210

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION EXAMINING OPERATIONS

Applicants:	Thomas M. Gillihan et al.	Group Art Unit:	
Serial No.:		Examiner:	
Filed:	(concurrently herewith)		
Title:	PRINTER CONTROLLER WITH ERROR RECOVERY FOR MULTIPLE LANGUAGE CAPABILITY		

POWER OF ATTORNEY

I, Jon K. Clemens, declare that I am the President and Chief Executive Officer of Sharp Laboratories of America, Inc., a Washington corporation, and am authorized to execute this document on its behalf. Sharp Laboratories of America, Inc., is the assignee of the entire right, title and interest in the above-referenced patent application and hereby appoints Jacob E. Vilhauer, Jr., Reg. No. 24,885, Charles D. McClung, Reg. No. 26,568, Dennis E. Stenzel, Reg. No. 28,763, Donald B. Haslett, Reg. No. 28,855, William O. Geny, Reg. No. 27,444, J. Peter Staples, Reg. No. 30,690, Karen Fienberg Oster, Reg. No. 37,621, Kevin L. Russell, Reg. No. 38,292, Nancy J. Moriarty, Reg. No. 40,733, Bruce W. DeKock, Reg. No. 40,585, and Timothy E. Siegel, Reg. No. 37,442, all of the firm of CHERNOFF, VILHAUER, McCLUNG & STENZEL, LLP, 600 Benj. Franklin Plaza, One Southwest Columbia, Portland, Oregon 97258, telephone number 503-227-5631, its attorneys, jointly and individually, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SHARP LABORATORIES OF AMERICA, INC.

Dated: 7/29/98

Jon K. Clemens
President and Chief Executive Officer